

# COELOMOMYCES PSOROPHORAE, AN AQUATIC FUNGUS PARASITIZING AEDES VEXANS MOSQUITO LARVAE IN KNOX COUNTY, NEBRASKA<sup>1</sup>

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**ABSTRACT.** The Water Resources Branch, Center for Disease Control (CDC), assessed mosquito production in the area surrounding Lewis and Clark Lake, on the Missouri River in South Dakota and Nebraska, during the period from June through August, 1975. Extensive collections of mosquito larvae were made. Eleven of 360 collections from Nebraska contained mosquito larvae infected with *Coelomomyces psorophorae*, whereas none of 135 collections from South Dakota contained infected larvae. This is the first report of *Coelomomyces* infecting mosquitoes in

Nebraska. Only 4th instar larvae of *Aedes vexans* were found infected. Fourth instar larvae of 9 other mosquito species were present in some of the positive collections, but none were infected. Infection rates in *Ae. vexans* were low: 0.9% of 9,016 fourth instar *Ae. vexans* from the 360 Nebraska collections, and 5.7% of the 1,451 4th instar *Ae. vexans* from the 11 collections were positive for *C. psorophorae*. A copepod, *Cyclops navus*, was present in some collections, but its possible role as an obligate alternate host for *C. psorophorae* was not determined.

**INTRODUCTION.** The Water Resources Branch (WRB), Center for Disease Control (CDC), assessed mosquito production in the area surrounding Lewis and Clark Lake, on the Missouri River in South Dakota and Nebraska, during the period from June through August, 1975. The objectives were to delineate larval mosquito habitats and make recommendations to the U.S. Army Corps of Engineers which would allow them to reduce or

eliminate the habitats. In the course of identifying the extensive collections of mosquito larvae, some *Aedes vexans* 4th instar larvae were found to be infected with the aquatic fungus, *Coelomomyces psorophorae*. The purpose of this report is to document the natural occurrence of this potentially important biological control agent in Nebraska.

*Coelomomyces* fungi occur principally in mosquitoes, but infections have also been reported in other aquatic Diptera (Laird 1971), notonectids (Couch 1945), and copepods (Whisler et al. 1974). The last finding is of particular significance since Whisler and his colleagues (1975) have shown that, in the laboratory, the

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copepod *Cyclops vernalis* is an obligate alternate host for *Coelomomyces psorophorae*. Similarly, Pillai et al. (1976) have demonstrated heteroecism in *Coelomomyces opifexi*. They cycled the fungus through *Aedes australis* and a copepod, *Tigriopus* sp. near *angulatus*, in the laboratory.

*Coelomomyces psorophorae* has been reported from 9 species of mosquitoes in the genera *Aedes*, *Psorophora*, *Culiseta*, and *Culex*; however, the taxon probably is composed of a species complex, since many of the *Coelomomyces* assigned to *C. psorophorae* seem to be host-specific (Chapman 1974). Previous records of *C. psorophorae* parasitizing *Ae. vexans* larvae in nature include collections from Moultrie, Georgia (Couch and Dodge 1947), from St. Paul, Minnesota (Laird 1961), from the Primorye Territory, U.S.S.R. (Kuznetsov and Mikheeva 1970), and from an island of the Upper Enisey in the vicinity of the town of Shagonar (the zone of arid steppes of Tuva, A.S.S.R.), U.S.S.R. (Goldberg et al. 1975). Chapman and Woodard (1966) reported *Coelomomyces* sp. in *Ae. vexans* larvae from southwestern Louisiana. In addition, there is an interesting report of *C. psorophorae* infecting the ovaries of adult female *Ae. vexans* in the Astrakhan Preserve, U.S.S.R. (Zharov 1973).

**MATERIALS AND METHODS.** Seven areas in Nebraska and 7 areas in South Dakota surrounding Lewis and Clark Lake were selected for collecting mosquito larvae. Among the 7 areas in each state, 63 collecting stations in Nebraska and 31 stations in South Dakota were sampled for mosquito larvae either weekly or bi-monthly during the period from June through August, 1975. Larval mosquito habitats were mapped, general vegetation patterns were described, and actual and potential breeding areas were estimated. Mosquito larvae were collected with an enamel dipper and preserved in Cello-solve®<sup>2</sup> on the date of collection. Specimens were shipped to our Fort Collins laboratory for subsequent identification.

**RESULTS AND DISCUSSION.** Collections

from Nebraska yielded 38,133 mosquito larvae, of which 22,336 were 4th instars. The South Dakota collections yielded 9,318 larvae, of which 6,310 were 4th instars. The species composition of the collections from the 2 states was similar with a total of 15 species being represented (CDC, Unpubl. data). *Culex tarsalis* was the predominant species in collections from both Nebraska (39%) and South Dakota (52%), and was followed in abundance by *Ae. vexans* (32% and 15%, respectively). Since none of 135 collections from South Dakota contained mosquito larvae infected with *Coelomomyces*, these collections will not be considered further in this report. Also, since *Coelomomyces* infections were apparent only in late 4th instar mosquito larvae in our collections, data presented below concerning larvae will refer to this instar.

The major areas from which mosquito larvae were collected in Nebraska are shown in Figure 1. Area I was negative for larvae; therefore, all of the mosquito larvae collected in Nebraska were from Knox County. *Coelomomyces* infections were detected in the preserved specimens at 10x to 30x magnification under a stereoscopic microscope. The entire body cavity and the siphon and anal gills of infected mosquito larvae frequently were packed tightly with sporangia (Figures 2,

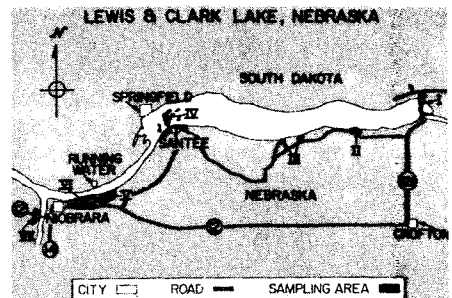


Fig. 1. Areas in Nebraska sampled for mosquito larvae.

<sup>2</sup> Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or by the U. S. Department of Health, Education, and Welfare.

3, and 4). Mature sporangia inside the larvae usually give the larvae an orange or reddish color.

Eleven of 360 collections (3.1%) of mosquito larvae from Nebraska contained

of *Coelomomyces* (H. C. Chapman, per comm.).

The observed incidence of *C. psorophorae* in our preserved collections from Nebraska (3.1%) and the infection rates

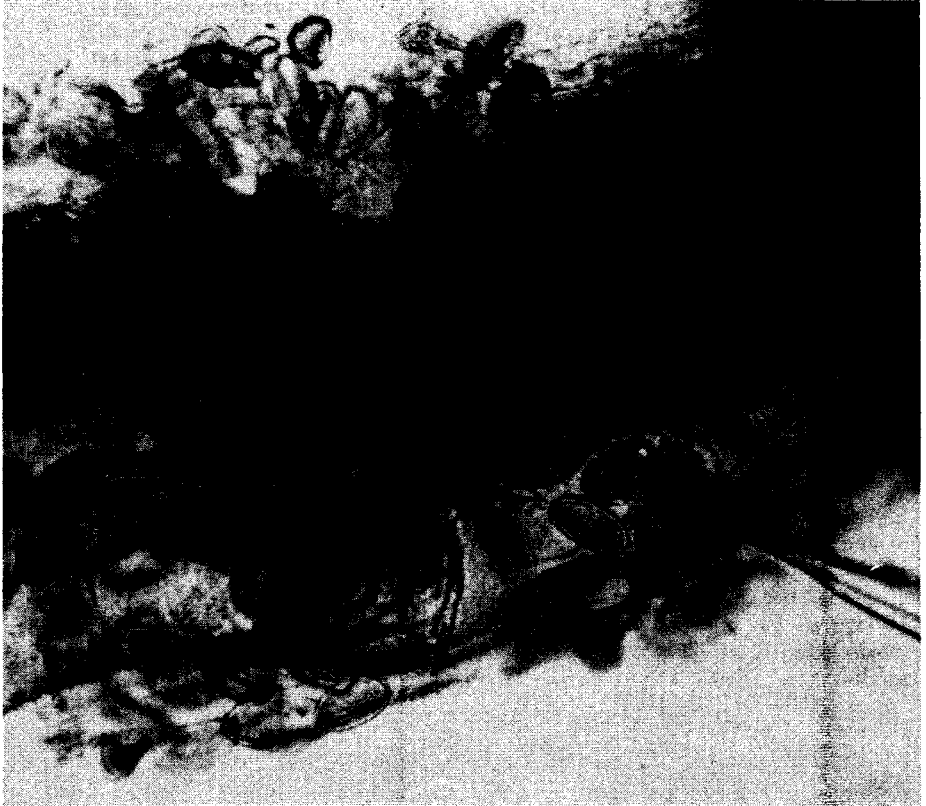


Fig. 2: Abdominal segments of *Aedes vexans* larvae infected with *C. psorophorae*.

specimens infected with *C. psorophorae*. All of the infected specimens were *Ae. vexans* 4th instar larvae. The collections containing infected *Ae. vexans* also contained 4th instar larvae of 9 other mosquito species which were uninfected (Table 1). This may reflect the apparent host specificity of varieties of *C. psorophorae* observed by other investigators and referred to above. It is interesting that, in addition to *Ae. vexans*, 6 of the mosquito species listed in Table 1 have been reported as hosts of various species

in *Ae. vexans* 4th instar larvae were low. Only 83 of 9,016 4th instar *Ae. vexans* from Nebraska (0.9%) were found infected, and in the 11 collections containing infected larvae, only 83 of 1,451 (5.7%) were patently infected. These results agree with the findings of other investigators who have noted that *Coelomomyces* fungi often are present in mosquito populations at very low levels and are likely to be detected only when large population samples are examined (Chapman 1974).

Table 1. A summary of 11 larval mosquito collections positive for *Coelomomyces psorophorae* from Knox County, Nebraska.

Species	Number of Times Present in 11 Positive Collections	Number of 4th Instar Larvae Infected/Collected
<i>Anopheles punctipennis</i>	1	0/1
<i>Aedes dorsalis</i>	5	0/83
<i>Aedes trivittatus</i>	3	0/8
<i>Aedes vexans</i>	11	83/1,451
<i>Culex pipiens pipiens</i>	1	0/2
<i>Culex salinarius</i>	5	0/29
<i>Culex restuans</i>	6	0/27
<i>Culex tarsalis</i>	3	0/62
<i>Culex territans</i>	1	0/1
<i>Culiseta inornata</i>	6	0/64

Six of the 11 positive collections were obtained during a 7-day period (June 20-26), 4 were obtained during July (7, 15, 21, and 31), and 1 on August 21. The collections which contained infected larvae were from areas II (Wiegand, 1 collection), V (Brazile Creek, 2 collections), VI (Niobrara, 7 collections), and VII (Niobrara State Park, 1 collection) (Figure 1). Only one collection station (in area VI) yielded more than 1 sample of infected larvae from the same station within an area (June 26 and July 15), although all but one of the remaining 9 stations positive for *C. psorophorae* were sampled 5 or more times during the season.

The habitats which contained infected

*Ae. vexans* are typical for floodwater *Aedes* mosquitoes, although some supported permanent-water species as well. In general, these habitats consist of intermittently flooded areas with growths of bulrushes, cattails, and water-tolerant grasses. An analysis of our data does not permit conclusions to be drawn concerning the impact of *C. psorophorae* on *Ae. vexans* populations in the habitats from which infected larvae were collected.

Copepods were unintentionally included in some collections along with infected *Ae. vexans* larvae. Although no causal relationship between these organisms and the occurrence of *C. psorophorae* was established, their presence in the collections seems noteworthy in view of the findings

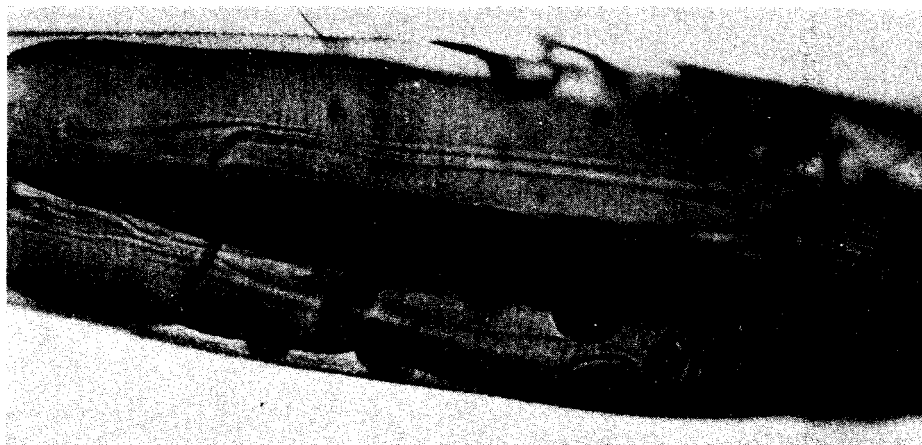


Fig. 3. Sporangia of *C. psorophorae* in siphon of *Aedes vexans* larva.



Fig. 4. Sporangia of *C. psorophorae* in anal gill of *Aedes vexans* larva.

of Whisler et al. (1975) and Pillai et al. (1976). The specimens were identified as *Cyclops navus*. This copepod occurs widely in prairie potholes which are intermittently flooded (E. B. Reed, per comm.). Its ecological requirements would seem to suit it very well for the role of an obligate alternate host for *C. psorophorae* which infect *Ae. vexans*. This possibility should be investigated.

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